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are, is plain. A wide barrier of sea and arid lands devoid of suitable vegetation separates at the present time the regions in which these insects, for the most part forest-loving, occur. The sandy wastes of Arabia and the rocky plateaus of Abyssinia are a great and impassable barrier, to say nothing of the Indian Ocean, to the transfer of genera which frequent the hot and dense forests of tropical West Africa and the equally hot and heavily timbered lowlands of India and the Malay archipelago. In Arabia, the present dividing region, many of these genera are altogether wanting.

Pararge and *Phyllocharis*, palæarctic genera, may have entered the region in which they now occur by migration along the Nile. It is quite different with the genus *Brenthis*, which occurs isolated upon the slopes of Kenia, Kilimanjaro, and Ruwenzori, the lofty volcanic peaks which dominate the plains of eastern and southeastern Africa. The nearest locality in which this genus finds representation at the present time is in the Alps of Switzerland, the Himalayas in India, and the Andean region of Patagonia. That the genus *Brenthis* should occur on the lofty summits of the East-African mountains and be there as the result of a migration from Switzerland, the Himalayas, or Patagonia, under conditions such as exist at the present time, is an untenable hypothesis, which no student would venture to advocate. The occurrence of *Hypanartia* only in Africa and South America, and the existence in Africa of the genus *Crenis*, so closely related to the South American genus *Eunica*, as scarcely to be separable from it, are facts pointing strongly to the existence in some remote time of a land connection between the continents of Africa and South America. Correlated with the facts as to the distribution of these genera of butterflies is the fact that in the avifauna of Africa and South America we find the *Struthionidæ*, or ostriches represented in both localities, and the species of the genus *Rhipsalis*, of the *Opuntieæ* occurring in the Cameroons and Madagascar, are witnesses in the floral world to the ancient bond between two now widely separated continents. To these facts cited by our author the writer may add the fact that in the elder groups of the arthropoda, as for ex-

ample the Phrynidæ, similar instances of the occurrence of closely related forms in Africa and tropical America occur. These things all go to confirm the view which is coming to be generally held by geologists and paleontologists upon apparently strong and sufficient grounds, that in the mesozoic and elder tertiary, a union between the Eastern and Western Hemispheres existed by means of an Antarctic continent, which has largely disappeared, but which at that time, in some way united Africa and Madagascar, and very probably likewise Australia, to the land-mass now known as South America.

Under the head of 'Mimicry' the author gives a list of forty-nine species which are mimicked and sixty-six species which mimic them. It is very doubtful whether this list is correct in representing certain species as mimes, especially where a species of *Terias* is represented as mimicking a *Pieris*, or a *Catopsilia* the female of *Teracolus*. The cases cited, with which the present writer is very familiar, do not come under the head of 'protective mimicry' at all, but fall into the common category of general resemblance or family likenesses. This part of the work, while interesting, gives evidence of less care in preparation and less familiarity with essential facts than any other part of the work.

Upon the whole the student of African entomology has great reason to be grateful to Professor Aurivillius for having had the patience and zeal to prepare this monumental volume, which must for years to come serve as a key for unlocking the treasures of knowledge as to the butterfly-fauna of the Dark Continent.

W. J. HOLLAND.

WESTERN UNIVERSITY OF PENNSYLVANIA,
February 24, 1900.

Zoological Results based on Material from New Britain, New Guinea, Loyalty Islands and elsewhere, collected during the years 1895, 1896 and 1897, by Arthur Willey. Cambridge, Eng., the University Press. 4to. Part III., May, 1899; pp. 207-356; plates XXIV.-XXXIII.

Part III. of Dr. Willey's 'Zoological Results' opens with an account by Gadow of the variations in the number and arrangement of the

scutes on the carapace of the loggerhead turtle. The material consisted in part of twenty specimens of new-born loggerheads all taken from one nest in New Britain and all showing abnormal numbers of scutes. This was supplemented by fifty-six other specimens from various collections, making in all a total of seventy-six individuals examined. The typical arrangement of the scutes on the loggerhead is as follows: The chief axis of the carapace is covered by six median elements; these are flanked by five pairs of costals; and the edges of the carapace are bounded by thirteen pairs of marginals. In studying the variation of these parts, Gadow has confined his attention to the median and costal elements. The variations in these series took the form of supernumerary scutes. Thus the total number of median elements may rise from six to seven or eight, and of costal elements on a given side from five, to six, seven, or even eight. In the costal scutes the variations were in some instances symmetrical, in others unsymmetrical. It will be observed that all these variations lie above the normal, and, as there is reason for believing that primitive turtles had a greater number of scutes than modern ones, Gadow holds that these variations are to be interpreted as atavistic. According to his belief, the ancestral turtles possessed at least eight median and eight pairs of costal plates. The reduction of these by which the condition in the loggerhead was reached, as indicated by the variations observed, was as follows: Of the original eight median scutes, the seventh was probably the first to disappear, followed by the fifth, thus giving rise to the series of six, typical for the loggerhead; of the original eight pairs of costals, the second pair was probably first lost, then the fifth and, by the fusion of the seventh and eighth, the condition of five pairs characteristic for this species was reached. For variations of this atavistic kind, Gadow, without further comment, proposes the term orthogenetic, a rather summary procedure in our opinion, since this term has already been extensively employed by Eimer for a different phenomenon. More or less looseness, however, pervades the whole paper and appears strikingly in the diagrammatic figures VII. and VIII. (p. 217), which, though

intended to make the subject clear, really lead to confusion from the fact that the system of cross-hatching adopted is incorrectly used. It is to be regretted that a little more care was not exercised in the preparation of what is otherwise an interesting and valuable contribution.

The second paper in this part is by Dr. Willey himself and deals with the South Pacific and West Indian Enteropneusta. To the five species of these worm-like animals previously known from the region in which Dr. Willey collected, three new species are added. Two other new species from the West Indies are also described. The paper contains a synopsis of the families and genera of the Enteropneusta and a full description of the new species. These organisms are of importance because of their supposed relation to vertebrates, and the concluding part of Willey's paper deals with their morphology from this standpoint. A comparison of the central nervous organs, of the supporting axis of the body, of tubules kidney-like in character, and of the gills in the Enteropneusta, the tunicates, and the vertebrates confirm the belief in the natural affinities of these three groups of animals. In the course of this discussion the author suggests the novel idea that the genital glands and gill-slits were primarily unlimited in number and coextensive in distribution, and that the primary function of the gill-slits was the oxygenation of the genital glands, their secondary function being the respiration of the individual.

The concluding paper is by Shipley and deals with the five species of Echinoids collected by Willey. A revision of this group of worms is given together with an account of their geographical distribution.

G. H. PARKER.

Minnesota Plant Life. By CONWAY MACMILLAN. Report of the Survey; Botanical Series, III. St. Paul, Minnesota, October 30, 1899. Octavo, 568 pages.

This is probably the most remarkable State report ever published. The author has given to the world a thoroughly scientific treatise, which is a contribution to our knowledge of the flora of Minnesota, and yet he has done so in such a way that, at the same time, the volume